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CALTRAIN SAN FRANCISCO
DOWNTOWN EXTENSION PROJECT
CONCEPTUAL DESIGN AND DRAFT EIS/EIR

Operating and Maintenance Costs Methodology Report

PENINSULA CORRIDOR JOINT POWERS BOARD

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CALTRANS S.F. DOWNTOWN STATION RELOCATION EIS/EIR

OPERATIONS AND MAINTENANCE COST METHODOLOGY REPORT



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EL PADRON & ASSOCIATES

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SECTION 1 - INTRODUCTION

1.0 PURPOSE OF REPORT

For the evaluation of alternatives being considered by the Peninsula Corridor Joint Powers Board (PCS) in the CalTrain S.F. Downtown Station Relocation EIS/EIR Project, methodology reports have been prepared to document the proposed analytic methods for evaluation of specific issues. This report documents the specific analytic methods, data sources and anticipated format of results for the estimation of operating and maintenance (O&M) costs.

In general, the steps of the O&M cost estimating process are:

1. Develop O&M cost model;
2. Calibrate the model for current year operations;
3. Generate operating plans and statistics for each mode;
4. Calculate annual operating and maintenance (O&M) costs.

This report documents the development and calibration of O&M cost models for the following transit operators: Peninsula Commute Service (PCS), San Mateo County Transit District (SamTrans) and San Francisco Municipal Railway (MUNI). The O&M cost models developed for PCS, SamTrans and MUNI are disaggregate, resource build-up models, consistent with the methodology specified by the Federal Transit Administration for major investment studies. The FTA guidelines have strong implications which affect costs and staffing requirements estimated for transit alternatives, especially the stipulation that all costs should be treated as variable (i.e., in the long-term, even modest changes in operations would tend to result in additional overtime pay or higher base wage rates corresponding to increased responsibilities).

Separate cost models have been prepared for this study. For PCS operations, three cost models have been developed for diesel, electric, liquified natural gas. For SamTrans, a cost model has been developed that estimates costs for motor bus and demand response operations. Finally, for MUNI, a cost model has been developed that estimates costs for motor bus, demand response, light rail, trolley bus and cable car operations.

The PCS, MUNI and SamTrans models include unique line items for labor and non-labor costs incurred in the operating budget. Lotus 1-2-3 has been used to develop the models, with each spreadsheet partitioned into three tables: system characteristics (input variables), a line item summary, and a cost summary by department and cost type or by section 15 categories.

PCS cost models reflect the current organizational structure of the Peninsula Commute Service and expenses budgeted for FY 1995. Labor cost and non-labor expenses are aggregated by departments.



SamTrans and MUNI cost models have been developed using FY 1994 Section 15 data. Labor costs for MUNI and SamTrans include the following functions: vehicle operations, vehicle maintenance, non-vehicle maintenance and general administration. Non labor costs have been categorized by the following object classes: services, materials and supplies, utilities, casualty and liability, purchased transportation, miscellaneous expenses, expenses transfer, leases and rentals.

1.1 INFORMATION SOURCES

The following information sources were used to develop and calibrate the PCS, SamTrans and MUNI O&M cost models:

Procedures and Technical Methods for Transit Project Planning, Urban Mass Transportation Administration, September 1986 (Chapter II.4 *Operating and Maintenance Costs*, revised September, 1990).

Peninsula Corridor Joint Powers Board Budget Proposal FY 1995-96, issued by SamTrans on June 21, 1995.

Peninsula Commute Service 1994-1995 AMTRAK Budget and Contract, February 1995.

FY 1994 Section 15 Report, Peninsula Corridor Joint Powers Board, January 5, 1995.

FY 1994 Section 15 Report, San Mateo County Transit District, February 17, 1995.

FY 1994 Section 15 Report, San Francisco Municipal Railway, February 8, 1995.

BART O&M Cost Model, User Manual, prepared by Manuel Padron & Associates for the San Francisco Bay Area Rapid Transit District, May, 1994.

Telephone conversations with Southwest Research Institute regarding liquified natural gas operations, June-July, 1995.

Telephone conversations with SamTrans staff regarding Amtrak and JPB costs, June-July, 1995.

Telephone conversations with Southeastern Pennsylvania Transportation Authority (SEPTA) staff regarding subway station facility maintenance costs, July, 1995.

Pacific Gas and Electric Company, Schedule E-20, January 1995.

1.2 GENERAL MODEL STRUCTURE

The O&M cost models calculate staffing requirements, labor costs and non-labor expenses based on the projected quantity of service supplied and the physical size of the system. Labor and non-labor costs are calculated using the general formulae discussed next.

Labor Cost Formulae

Labor costs are a function of the number of employees in each job classification and the average annual cost per employee. The average cost per employee is based on actual wage and fringe benefit rates paid.

The generalized equation for labor costs is of the form:

Annual Labor Cost	=	Value of Driving Variable	x	Labor Productivity Rate	x	Annual Cost Per Employee
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where:

Driving Variable Value: The quantity of the input variable which most strongly influences a cost item. For instance, the number of vehicle repair mechanics depends upon the number of train-miles or car-miles operated annually.

Labor Productivity Rate: The number of budgeted positions divided by the value of the driving variable for the calibration (base) level of service. This factor implicitly accounts for local union rules, hiring and training new employees, worker efficiency, and absenteeism.

Annual Cost per Employee: Average annual earnings which includes straight wages or salary, vacation, holiday and sick pay; plus fringe benefits, such as pension funds, social security, and medical insurance.

PCS cost models also indicate the number of staff positions required to operate the commuter rail system. This data is valuable for calculating the labor productivity of study alternatives.

Non-Labor Cost Formulae

Non-labor costs include expense categories such as materials, utilities, and contract services. These expenses are generally a function of the base year cost, and the base and future values of

the driving variables. This function assumes that current rates of consumption will continue in future years.

Cost equations for non-labor items are generally of the form:

Annual Non-labor Cost	=	Total Base Cost	÷	Base Driving Variable	x	Future Driving Variable
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where:

Total Base Cost: Actual expense in the base, or calibration, year modeled.

Driving Variables: The quantity of the input variable which corresponds to the variable identified as influencing a cost item.

SECTION 2 - PCS O&M COST MODELS

2.0 GENERAL MODEL DESCRIPTION

Disaggregate and resource build-up cost models have been developed for diesel, electric, and liquified natural gas (LNG) operations. The cost models developed in this section are based on actual operating budgets for FY 1995 and existing 60-train PCS service. The models present line item costs within specified powered cost centers (e.g., administration, maintenance of way, maintenance of equipment, train operations, police, JPB costs). Within each cost center, line item costs are defined as follows: labor, material, services, utilities, fuel and miscellaneous costs.

Specific line items have been included for each unique labor position (e.g., electronic technician, trackman, operator/tamper) and non-labor expense (e.g., track materials, maintenance material, repair services). Each labor and non-labor expense has been modelled as a separate line item, thus ensuring that the equations are mutually exclusive and cover all operating costs. O&M costs are then calculated based on the quantity of service supplied and other system characteristics.

Each cost model consists of a Lotus 1-2-3 spreadsheet that has been partitioned into the following tables:

Table 1	Input Variables
Table 2	Labor Cost List
Table 3	Non-Labor Cost List
Table 4	Line Item Cost Summary
Table 5	Cost Summary Tables

2.1 PCS DIESEL O&M COST MODEL

Input Variables

The model's input variables determine, directly or indirectly, the estimated costs for all line items in the model. Some labor and non-labor cost items are linked to secondary variables, such as the number of employees or total cost. The cost model was calibrated with operating statistics and system characteristics from PCS' FY 1994 Section 15 Report and estimated data for FY 1995. Each of the following variables will be estimated for the study alternatives based on the operating plans and ridership forecasts:

- **Annual Passenger Trips:** The number of unlinked passenger trips using the commuter

rail system in the forecast year. PCS is projected to carry an estimated 5.8 million passengers during FY 1995.

- **Peak Gallery Passenger Cars:** The maximum number of commuter rail vehicles scheduled during the AM or PM peak period. Current 60-train schedules require 67 passenger cars for peak period operations.
- **Fleet Gallery Passenger Cars:** The total number of commuter rail vehicles in the active fleet. In FY 1995, PCS had 73 passenger cars.
- **Peak Trainsets:** The maximum number of locomotives scheduled during the AM or PM peak period. Current 60-train schedules require 17 trainsets during the peak periods.
- **Fleet Locomotives:** The total number of locomotives in the active fleet. In FY 1995, PCS's fleet was made of 20 locomotives.
- **Annual Train Trips:** The total number of annual scheduled round trips operated by PCS in revenue service in one year. Current train schedules require about 17,700 train trips based on 60 weekday, 24 Saturday and 20 Sunday trips between Tamien and San Francisco and 8 weekday trips to/from Gilroy.
- **Annual Train-Hours:** The total train-hours operated in revenue service, including end-of-line layover time and deadhead time, but excluding report time. In FY 1994, PCS operated about 30,400 train-hours. Using total train-hours rather than revenue train-hours, the model will be sensitive to deadhead operating requirements that differ for the various study alternatives.
- **Annual Train-Miles:** The total train-miles, including deadhead mileage. In FY 1994, PCS operated about 970,900 train-miles.
- **Annual Car-Miles:** The total car-miles, including deadhead mileage. In FY 1994, PCS operated about 3.6 million car-miles.
- **Route-Miles:** The route-miles operated by PCS from San Francisco to Tamien and from Tamien to Gilroy. Current mileage between San Francisco and Tamien is 51.4 miles and between Tamien and Gilroy is 25.4 miles.
- **Total Stations:** The total number of passenger stations in the commuter rail system including terminal stations. Currently, PCS provides service to 34 stations.
- **Terminal Stations:** PCS has 2 terminal stations that provide ticketing and other passenger amenities: Cahill in San Jose and 4th/Townsend in downtown San Francisco.

- **Storage and Maintenance Yards:** PCS performs overnight storage and maintenance functions in 3 yards: Cahill, 4th/Townsend and Gilroy.
- **Park-and-Ride Spaces:** The number of park-and-ride parking spaces in the commuter rail system. Currently, PCS has about 4,400 parking spaces between San Francisco and Tamien and 1,000 parking spaces between Tamien and Gilroy.

Table 1 in Appendix A presents the input variables used to calibrate the cost model.

Labor Costs

Commuter rail operations are contracted by Amtrak. The labor cost list (Appendix A, Table 2) lists current Amtrak job classifications identified for the different departments. The labor cost list contains the average base salary, overtime and salary fringe benefits for each job classification. Base salaries include sick, holiday, vacation and other paid absences, but exclude fringe benefits and overtime wages.

PCS cost centers include: General Administration, Maintenance of Way, Maintenance of Equipment, Train Operations, Train & Yard Movement Control, Revenue Collection, Revenue Accounting, Budgets, Material Control, Police and JPB Costs. In the Train Operations, Maintenance of Way and Maintenance of Equipment cost centers, labor costs for each individual position have been uniquely determined. In all other cost centers, labor costs have been aggregated.

Non-Labor Costs

Non-labor cost items have been classified by cost center and cost type (e.g., materials, maintenance, utilities and insurance). For each non-labor cost item, the cost model identifies the type (e.g., parts and supplies, insurance, utilities, and JPB costs), lookup cost code, driving variable, and unit cost (e.g., track material per route-mile).

The following major functions have been assumed to be paid directly by the JPB: public liability and physical damage insurances; adjustments for incentive payments; penalty assessments; extrawork; shuttles, timetables and tickets; utilities; fuel; and trackage maintenance between Lick and Gilroy.

Table 3 in Appendix A presents non-labor costs for PCS.

Line Item Listing

The line item listing (Appendix A, Table 4) combines labor and non-labor items and calculates costs and staffing requirements based on the input variables. Costs are shown by cost center and

cost type. Within each cost center, labor cost items are listed first, followed by non-labor costs.

Expenses are generally a function of the base year cost, and the base and future values of the driving variables. This function implicitly assumes that current rates for consumption will continue in future years. Equations link each item with the operating variable responsible for driving its cost.

The following information is recorded in the model for each line entry:

- Cost item description,
- Cost type (i.e., labor, other, service, material and supplies),
- Lookup codes (refers to labor and non-labor cost tables for unit costs)
- FY 1995 costs,
- Driving variable,
- Number of employees in each staff position,
- Total line item cost, and
- Total department cost.

The line item listing table also calculates total system cost, cost per train-hour, cost per train-mile, cost per car-mile and cost per passenger.

Cost Summary Tables

The next table (Appendix A, Table 5) tabulates cost estimates by cost center and cost type along with the number of employees by cost center.

2.2 PCS ELECTRIC O&M COST MODEL

One of the study alternatives features the use of electric powered locomotives in lieu of diesel powered locomotives. In order to develop electric O&M costs that are consistent with current costs, the diesel O&M cost model has been modified to include specific characteristics of electrification as described below.

Similar to the PCS diesel O&M cost model, the PCS electric cost model consists of a Lotus 123 spreadsheet that has been partitioned into five tables: input variables, labor cost list, non-labor cost list, line item listing, and costs by cost center and cost type and employees by cost center. Unit costs and labor productivity rates were based on detailed staffing and budget data from the Bay Area Rapid Transit (BART), adjusted to reflect differences in equipment and facilities that affect operations and maintenance costs (e.g., AC vs. DC power, fewer substations associated with 25kV power distribution system).

Electric operations require new labor positions necessary to maintain the overhead catenary and power distribution system. Additional positions include a Power & Line Supervisor, Power &

Line Foremen and Power & Line Maintainers in the Maintenance of Rail Line cost center. Based on labor productivity factors for comparable rail operations, electrification of the line from San Francisco to Gilroy will require about thirteen new employees to maintain the overhead catenary and power distribution system.

Non-labor costs related to electric operations have also been identified. In the Maintenance of Equipment cost center, materials and purchased services unit costs were adjusted to reflect lower equipment maintenance costs associated with electric locomotives. In addition, power & line materials costs were added based on costs for comparable rail operations.

With electrification, diesel fuel costs are replaced with electric traction power costs. Electric traction power costs are based on energy consumption rates derived for electric locomotives (**Feasibility Study for Electrifying the CalTrain/PCS Railroad**, October 1992) and electric power rates for Pacific Gas & Electric (rate schedule E-20). The electric O&M cost model includes a traction power worksheet that calculates customer, energy and demand charges, power adjustment and state surcharge. The projected average power consumption rate (kilowatt-hours per revenue car-mile) and the average power demand rate (kilowatts per peak car) have been input to the traction power worksheet.

With the electric mode, PCS' total current cost would increase from about \$45.4 million (diesel mode) to about \$47.2 million (electric mode). The cost per train-hour would increase from \$1,493 to \$1,551, and the cost per passengers would increase from \$7.83 to \$8.13.

The electric O&M cost model has been tested by applying operating statistics from the previous *MTC/JPB CalTrain Downtown Extension and System Upgrades study*. The model shows that with the 60 and 66 train schedules, diesel powered locomotives cost less to operate than electric powered locomotives. However, at the 114 and 156 train schedules, electrified service has lower operating costs than diesel. This suggests that electric powered operations are more expensive than diesel operations at low levels of service, but become more cost-effective at higher service levels.

Costs associated with electric locomotives generally differ from diesel mode costs in the following cost centers: Maintenance of Rail Line, Maintenance of Service Equipment and Power Consumption. It is important to note that electric power costs are higher than diesel fuel costs at the 60 and 66 train schedules. However, electric power costs become lower than diesel fuel costs for the 114 and 158 train schedules, as indicated in the **Feasibility Study for Electrifying the CalTrain/PCS Railroad**, October 1992.

The following table summarizes the major variances between diesel operations and electric operations for 60-train schedule.

LINE ITEMS SPECIFICALLY RELATED TO ELECTRIC OPERATIONS

COST ITEM	COST TYPE	DIESEL		ELECTRIC	
		# OF EMPL'S	LINE ITEM COST	# OF EMPL'S	LINE ITEM COST
100 - GENERAL AND ADMINISTRATIVE					
OTHER					
Reallocation Expenses	OTHER		\$180,000		\$199,969
200 - MAINTENANCE OF WAY					
LABOR - TRACK					
Power & Line Supervisor	LABOR	0	\$0	1	\$63,840
Power & Line Foreman	LABOR	0	\$0	3	\$145,152
Power & Line Maintainer	LABOR	0	\$0	9	\$325,987
MATERIALS					
Power & Line Materials	MATL		\$0		\$12,500
300 - MAINTENANCE OF EQUIPMENT					
Maintenance Mat'l - Locomotive	MATL		\$573,136		\$458,509
Loco. Engine & Generator Repair	MATL		\$166,500		\$133,200
ELCTRIC POWER					
Power Usage	MATL		\$0		\$2,634,259
1100 - AMTRAK GENERAL OVERHEAD	OTHER		\$1,399,881		\$1,573,946
1200 - AMTRAK MANAGEMENT FEE	OTHER		\$1,479,674		\$1,663,661
1300 - JPB COSTS					
FUEL	OTHER		\$2,217,451		\$0
OTHER AMTRAK CONTRACT	OTHER		\$2,029,087		\$2,244,868
RECOLLECTIBLE RECOVERIES	OTHER		(\$1,666,486)		(\$1,843,707)
G&A/SUPPORT					
G&A and Professional Services	OTHER		\$4,280,600		\$4,735,817
Other Expenses and Services					
Other Expenses	OTHER		\$820,971		\$908,276
TOTAL		0	\$11,480,814	13	\$13,256,277
VARIANCE (Electric vs. Diesel)				13	\$1,775,463

ELECTRIC MODE COST SUMMARY:

Total Cost (FY 1995\$)=	\$47,169,178
Cost per Train Hour =	\$1,551
Cost per Train Mile =	\$48.58
Cost per Car Mile =	\$13.16
Cost per Passenger =	\$8.13

Prepared by Manuel Padron & Associates

08/28/95

2.3 PCS LNG COST MODEL

Another study alternative features replacing or rebuilding PCS' current fleet of diesel locomotives with liquified natural gas (LNG) powered locomotive. Although no U.S. transit agency is currently using LNG in its powered locomotives, LNG powered locomotives might become more commonplace due to federal and state clean air act requirements. In order to develop LNG O&M costs that are consistent with current costs, the diesel O&M cost model has been modified to include specific characteristics of LNG operations as described below.

Similar to the PCS diesel O&M cost model, the PCS LNG cost model consists of a Lotus 123 spreadsheet that has been partitioned into five tables: input variables, labor cost list, non-labor cost list, line item listing, and costs by department and cost type and employees by department.

The diesel O&M cost model has been modified to incorporate two additional laborers in the Maintenance of Equipment cost center for maintaining the LNG fueling facility and fueling the LNG locomotives.

The LNG O&M cost model also includes non-labor costs specifically related to LNG operations. The most important non-labor cost difference between diesel and LNG operations is related to fuel costs. Research suggests that LNG fuel unit cost is about \$0.32 per gallon. Although LNG requires 70% more fuel per diesel equivalent, resulting in higher fuel consumption, total fuel costs for LNG operations are lower than those of diesel operations.

In addition, drainage of LNG fuel tanks has been included in the LNG O&M cost model. Preliminary cost estimates indicate a cost of about \$17,500 per locomotive per year to drain LNG tanks. Vehicle maintenance costs for LNG-powered locomotives were assumed to be the same as for diesel-powered locomotives.

For the current operations, the LNG mode cost model indicates a staffing requirement of 319 employees and a total operating cost of about \$45.1 millions. The cost per train hour decreases to \$1,482 and the cost per passenger decreases to \$7.77. This indicates that LNG operations are more cost effective than diesel operations.

The following table summarizes the major variances between diesel operations and LNG operations.

LINE ITEMS SPECIFICALLY RELATED TO LNG OPERATIONS

COST ITEM	COST TYPE	DIESEL		LNG	
		# OF EMPL'S	LINE ITEM COST	# OF EMPL'S	LINE ITEM COST
100 - GENERAL AND ADMINISTRATIVE					
OTHER					
Reallocation Expenses	OTHER		\$180,000		\$180,000
300 - MAINTENANCE OF EQUIPMENT					
SF/SJ/GILROY DIVISIONS-WAGES					
Laborer	LABOR	6	\$236,849	8	\$290,289
OTHER					
Drainage of LNG	OTHER		\$0		\$350,000
1100 - AMTRAK GENERAL OVERHEAD	OTHER		\$1,399,881		\$1,422,877
1200 - AMTRAK MANAGEMENT FEE	OTHER		\$1,479,674		\$1,503,981
1300 - JPB COSTS					
FUEL	OTHER		\$2,217,451		\$1,444,783
OTHER AMTRAK CONTRACT	OTHER		\$2,029,087		\$2,029,087
RECOLLECTIBLE RECOVERIES	OTHER		(\$1,666,486)		(\$1,666,486)
G&A/SUPPORT					
G&A and Professional Services	OTHER		\$4,280,600		\$4,280,600
Other Expenses and Services					
Other Expenses	OTHER		\$820,971		\$820,971
TOTAL		6	\$10,978,027	8	\$10,656,102
VARIANCE (LNG vs. Diesel)				2	(\$321,925)

LNG MODE COST SUMMARY:

Total Cost (FY 1995\$)=	\$45,071,789
Cost per Train Hour =	\$1,482
Cost per Train Mile =	\$46.42
Cost per Car Mile =	\$12.57
Cost per Passenger =	\$7.77

Prepared by Manuel Padron & Associates

09/06/95

2.4 SUBWAY STATION AND TUNNEL FACILITY MAINTENANCE

For study alternatives that include a subway station, additional O&M costs which relate to subway station and tunnel facility maintenance will be added to the commuter rail O&M cost estimates described in previous sections. The proposed subway station is assumed to have three levels and four tracks with platforms about 1,000 feet long. Two tracks would be provided on each of two levels, with a (third) mezzanine level would be provided for ticketing and other passenger facilities. A 1.5-mile tunnel would lead to the subway station.

Subway station and tunnel facility maintenance costs were researched for the following comparable station facilities: (1) Bay Area Rapid Transit (BART) subway stations in downtown San Francisco; and (2) the Market East subway commuter rail station in downtown Philadelphia.

BART Subway Stations

The BART stations in downtown San Francisco have three levels -- a mezzanine, MUNI platform with two tracks, and BART platform also with two tracks. BART stations are about 700 feet long. A detailed, resource build-up O&M cost model was recently developed for BART by Manuel Padron & Associates (**BART O&M Cost Model User Manual**, May, 1994). The model includes station related labor and non-labor expenses in the following BART cost centers:

- Operations Administration & Facilities Management
- Communications & Component Repair (AFC Maintenance, Communications Maintenance)
- Power & Way Maintenance (Power & Mechanical, Track & Structures)
- Transportation (Station Appearance, Station Operations)

The BART model calculated an incremental staffing requirement of 11.0 employees and \$895,000 (1993 dollars) for an average subway station. Given the longer length of the proposed PCS subway station, the estimated station and tunnel facility maintenance would be about 50% more than the average BART subway station, or about \$1.34 million.

SEPTA Market East Station

The Southeastern Pennsylvania Transportation Authority (SEPTA) has been contacted to determine station and tunnel facility maintenance costs for its Market East Station in downtown Philadelphia. At this time, detailed cost data has not been provided.

Subway Station and Tunnel Facility Maintenance Unit Cost

A preliminary facility maintenance unit cost of \$1.34 million will be used to estimate O&M

costs for the proposed subway station and tunnel based on detailed cost data for comparable BART subway stations. If more information becomes available, the unit cost will be updated.

SECTION 3 - SAN MATEO COUNTY TRANSIT DISTRICT O&M COST MODEL

3.0 GENERAL MODEL DESCRIPTION

This section presents the process used to develop an operating and maintenance (O&M) cost model for San Mateo County Transit District (SamTrans). Labor and non-labor costs have been reported by the following Section 15 object classes: operator wages and salaries, other wages and salaries, fringe benefits, services, materials and supplies, utilities, casualty and liability, purchased transportation, miscellaneous expenses, expenses transfer, leases and rentals. Labor and non-labor costs have been reported by mode (e.g., motor bus and demand response) and function (vehicle operations, vehicle maintenance, non-vehicle maintenance and general administration).

The SamTrans model estimates O&M costs for motor bus and demand response operations. The model is structured in a series of equations that project costs as a function of the quantity of service supplied (e.g., fleet vehicles, vehicle miles). Lotus 123 has been used to develop the model, with the spreadsheet partitioned into three tables: system characteristics (input variables), a line item summary, and a cost summary by cost function and by Section 15 object code. The cost model is presented in Appendix B.

Input Variables

The cost model's input variables determine, directly or indirectly, the estimated costs for all line items in the model. The cost model was calibrated with FY 1994 operating statistics and system characteristics from SamTrans' FY 1994 Section 15 report. Each of the following variables will be estimated for the study alternatives based on the operating plans and riderships forecasts.

- **Motor Bus Unlinked Passenger Trips:** SamTrans' FY 1994 annual motor bus ridership was 19.6 million. Average weekday ridership for the study alternatives will be obtained from ridership forecasts. Future ridership projections will be multiplied by annualization factors of 296.3 for motor bus (direct operations and purchased transportation) operations.
- **Revenue Vehicle-Miles:** The total motor bus-miles operated by SamTrans in revenue service, excluding deadhead mileage. During FY 1994, SamTrans operated 7.9 million motor bus revenue bus-miles.
- **Revenue Vehicle-Hours:** The total bus-hours or train-hour operated in revenue service, excluding report and deadhead time. For 1994, SamTrans operated about 690,000

revenue bus-hours and 68,000 revenue demand response-hours.

- **Peak Period Vehicles:** The maximum number of motor buses directly operated by SamTrans during the A.M. or P.M. peak periods. In 1994, 251 motor buses were required for peak period operations.
- **Inflation Factor:** A user-supplied factor to inflate or deflate estimated O&M costs for validation years.

Table 1 in Appendix B presents the cost model's input variables.

Line Item Summary

The cost model's line item summary combines labor and non-labor expenditures. Each expenditure's cost estimate is driven by one of the input variables. The line item summary notes the expense item, the FTA Section 15 cost object code, the FY 1994 expense for the item, the driving variable and the estimated total cost. Table 2 in Appendix B presents the model line item summary table, calibrated with FY 1994 expenses. Equations link each item with the operating variable responsible for its cost.

Cost Summary Tables

The third part of the cost model aggregates O&M costs by cost function and by Section 15 object classes. The cost function section summarizes vehicle operations, vehicle maintenance, non-vehicle maintenance, and general administration costs for each transit mode presented in the model. Table 3 in Appendix B presents the model's calibration of FY 1994 budgeted costs by these cost categories.

Validation Results

The ability of the cost model to accurately estimate O&M costs for future study alternatives has been tested by applying the model to two prior fiscal years of operation: FY's 1992 and 1993. Input variables and actual O&M costs for FYs 1992 and 1993 were obtained from SamTrans Section 15 data. Estimated (model) costs were deflated to the specified fiscal year with Bureau of Labor Consumer Price Index data.

Table 4 in Appendix B presents validation results for the SamTrans O&M cost model. The cost model was found to underestimate total operating costs for FY 1992 and 1993, with the model estimating within 3.7 to 4.0 percent of actual total costs. Labor costs were underestimated by 10.0 to 11.5 percent. This may indicate that SamTrans wages have increased at a considerably higher rate than inflation. In both validation years, demand response costs were underestimated by 13.9 and 21.2 percent. This is probably due to significant increases in demand response expenditures in 1992 and 1993 in response to ADA requirements.

SECTION 4 - SAN FRANCISCO MUNICIPAL RAILWAY O&M COST MODEL

4.0 GENERAL MODEL DESCRIPTION

This section presents the process used to develop an operating and maintenance (O&M) cost model for San Francisco Municipal Railway (MUNI). Labor costs have been reported by the following Section 15 object classes: operator wages and salaries, other wages and salaries, fringe benefits, services, materials and supplies, utilities, casualty and liability, purchased transportation, miscellaneous expenses, expenses transfer, leases and rentals. Labor and non-labor costs have been reported by mode (i.e., motor bus, demand response, light rail, trolley bus and cable car) and function (vehicle operations, vehicle maintenance, non-vehicle maintenance and general administration).

The MUNI model estimates annual costs for motor bus, demand response, light rail, trolley bus and cable car operations. The model is structured in a series of equations that project costs as a function of the quantity of service supplied (e.g., fleet vehicles, vehicle miles). Lotus 123 has been used to develop the model, with the spreadsheet partitioned into three tables: system characteristics (input variables), a line item summary, and a cost summary by cost function and by Section 15 object code. The cost model is presented in Appendix C.

Input Variables

The cost model's input variables determine, directly or indirectly, the estimated costs for all line items in the model. The cost model was calibrated with FY 1994 operating statistics and system characteristics from MUNI's FY 1994 Section 15 report. Each of the following variables will be estimated for the study alternatives based on the operating plans and riderships forecasts.

- **Unlinked Passenger Trips:** MUNI's FY 1994 annual ridership was 94.0 million motor bus riders, 37.6 million light rail patrons, 78.8 million trolley bus riders and 9.6 million cable car passengers. Average weekday ridership for the study alternatives will be obtained from ridership forecasts. The future ridership projections will be multiplied by annualization factors of 313.8 for motor bus, 299.4 for light rail, 323.0 for trolley bus and 347.1 for cable car operations.
- **Revenue Vehicle-Miles:** The total vehicle-miles operated by MUNI in revenue service, excluding deadhead mileage. During FY 1994, MUNI operated 12.6 million motor bus, 3.6 million light rail, 7.1 million trolley bus, and 0.5 million cable car revenue vehicle-miles.
- **Revenue Vehicle-Hours:** The total bus-hours, train-hours or cable car-hours operated in

revenue service, excluding report and deadhead time. For 1994, MUNI operated 1.37 million revenue bus-hours, 0.10 million revenue demand response-hours, 0.34 million light rail revenue vehicle-hours, 0.99 million revenue trolley bus-hours and 0.13 million revenue cable car-hours .

- **Peak Period Vehicles:** The maximum number of motor buses directly operated by MUNI during the A.M. or P.M. peak periods. In 1994, 379 motor buses, 99 light rail vehicles, 264 trolley buses and 26 cable car vehicles were required for peak period operations.
- **Inflation Factor:** A user-supplied factor to inflate or deflate estimated O&M costs for validation years..

Table 1 in Appendix C presents the cost model's input variables.

Line Item Summary

The cost model's line item summary combines labor and non-labor expenditures. Each expenditure's cost estimate is driven by one of the input variables. The line item summary notes the expense item, the FTA Section 15 cost object code, the FY 1994 expense for the item, the driving variable and the estimated total cost. Table 2 in Appendix C presents the model line item summary table, calibrated with FY 1994 expenses. Equations link each item with the operating variable responsible for its cost.

Cost Summary Tables

The third part of the cost model aggregates O&M costs by cost function and by Section 15 object classes. The cost function section summarizes vehicle operations, vehicle maintenance, non-vehicle maintenance, and general administration costs for each transit mode presented in the model. Table 3 in Appendix C presents the model's calibration of FY 1994 budgeted costs by these cost categories.

Validation Results

The ability of the cost model to accurately estimate O&M costs for future study alternatives has been tested by applying the model to three prior fiscal years of operation: FY's 1991, 1992 and 1993. Input variables and actual O&M costs for FYs 1991, 1992 and 1993 were obtained from MUNI Section 15 data. Estimated (model) costs were deflated to the specified fiscal year with Bureau of Labor Consumer Price Index data.

Table 4 in Appendix C presents validation results for the MUNI O&M cost model. The cost model was found to overestimate total operating costs for FYs 1991, 1992 and 1993, with the model estimating within 0.4 to 10.1 percent of actual total costs. Labor costs were overestimated

by less than 3 percent. However, non-labor costs were overestimated by as much as 33.1 to 37.1 percent in 1991 and 1992. This indicates that non-labor expenditures were considerably higher in 1994 than in previous years. Also, demand response costs were overestimated in 1991 and 1992 reflecting significantly increased expenditures in 1993 and 1994 as a result of ADA.



APPENDIX A

PCS Diesel Mode O&M Cost Model

CALTRAIN DOWNTOWN STATION RELOCATION PROJECT
TABLE A-1. PCS DIESEL MODE O&M COST MODEL - INPUT VARIABLES

SYSTEM CHARACTERISTIC	VARIABLE NAME	CALIBRATION		DATA SOURCE
		DIESEL 60 Train		
Annual Passengers	PASS	5,800,000		(1)
Peak Gallery Passenger Cars	PKCAR	67		(1)
Fleet Gallery Passenger Cars	TOTCAR	73		(3)
Peak Trainsets (Locomotives)	PKLOCO	17		(1)
Fleet Locomotives	TOTLOCO	20		(3)
Annual Scheduled Service Train Trips	TRIPS	17,672		(2)
Total Annual Train-Hours	TRAINHR	30,412		(3)
Total Annual Train-Miles	TRAINMI	970,880		(3)
Total Annual Car-Miles	CARMILE	3,585,398		(3)
Route-Miles: SF to Tamien	RTMILE1	51.4		(1)
Route-Miles: Tamien to Gilroy	RTMILE2	25.4		(1)
Total Stations	STATION	34		(4)
Terminal Stations	TERMINAL	2		(5)
Storage & Maintenance Yards	YARD	3		(6)
Park-and-Ride Spaces	PNR	5,400		(7)

NOTES:

- (1) These operating statistics have been estimated by Manuel Padron & Associates and updated by PCS.
- (2) Trips are calculated based on 60 scheduled service trips on weekday, 24 on Saturdays and 20 on Sundays.
Total trips do not include non-scheduled trips.
- (3) These operating statistics are derived from PCS FY 1994 Section 15 report.
- (4) Total stations include Gilroy extension stations.
- (5) Cahill and San Francisco (4th/Townsend).
- (6) Cahill (maintenance & storage), San Francisco (storage) and Gilroy.
- (7) PCS has 4,400 spaces between San Francisco and Tamien and 1,000 spaces between Tamien and Gilroy.



CALTRAIN DOWNTOWN STATION RELOCATION PROJECT
TABLE A-2. PCS DIESEL MODE O&M COST MODEL - LABOR COST LIST

JOB CLASSIFICATION	JOB CODE	BASE SALARY	OVERTIME	FRINGE BENEFITS	TOTAL COST	FTE's
100 - GENERAL ADMINISTRATIVE						
WAGES	101	\$338,472	\$2,792	\$159,121	\$500,385	7
FELA	102				\$8,666	
200 - MAINTENANCE OF WAY						
ADMINISTRATION - WAGES	201	\$261,000	\$0	\$120,896	\$381,896	5
TRACK - WAGES						
Foreman - Track Inspection	202	\$33,035	8.0%	\$16,885	\$53,884	1
Foreman - Track	203	\$99,105	8.0%	\$50,655	\$161,653	3
Trackman	204	\$26,884	8.0%	\$13,741	\$43,851	1
Operator/Tamper	205	\$31,401	8.0%	\$16,050	\$51,219	1
Operator/Regulator	206	\$31,401	8.0%	\$16,050	\$51,219	1
Operator/Compactor	207	\$31,401	8.0%	\$16,050	\$51,219	1
Operator/Backhoe	208	\$62,802	8.0%	\$32,099	\$102,437	2
Welder	209	\$30,626	8.0%	\$15,654	\$49,955	1
Welder's Helper	210	\$28,712	8.0%	\$14,675	\$46,832	1
Truck Driver	211	\$59,833	8.0%	\$30,582	\$97,595	2
Equipment Repairman	212	\$31,659	8.0%	\$16,182	\$51,640	1
Night Gang Pay Differential	213				\$13,604	
COMMUNICATIONS AND SIGNALS - WAGES						
Inspector	214	\$38,283	8.0%	\$19,567	\$62,444	1
Maintainer - C&S	215	\$372,376	8.0%	\$190,330	\$607,391	11
Maintainer - Tests	216	\$67,705	8.0%	\$34,606	\$110,436	2
Radio Technician Lead	217	\$39,444	6.0%	\$19,861	\$62,855	1
Electronic Technician	218	\$38,369	8.0%	\$19,611	\$62,584	1
FELA	219				\$104,304	
RECOLLECTIBLE WORK FORCE	220				\$40,000	
300 - MAINTENANCE OF EQUIPMENT						
ADMINISTRATION - WAGES	301	\$167,500	\$0	\$77,586	\$245,086	3
SF/SJ/GILROY DIVISIONS - WAGES						
Foreman	302	\$342,072	6.0%	\$173,542	\$546,400	9
Electrician	303	\$537,523	6.0%	\$272,699	\$858,599	17
Machinist	304	\$221,333	6.0%	\$112,288	\$353,541	7
Carman	305	\$717,751	6.0%	\$368,946	\$1,151,295	23
Coach Cleaner	306	\$399,142	6.0%	\$224,717	\$659,782	18
Pipefitter	307	\$63,238	6.0%	\$32,082	\$101,011	2
Laborer	308	\$147,081	6.0%	\$76,531	\$236,849	6
Clerk	309	\$31,024	2.0%	\$15,150	\$47,105	1
FELA	310				\$243,049	
ADA TRAINING	311				\$14,840	
400 - TRAIN OPERATIONS						
ADMINISTRATION	401	\$162,640	\$0	\$75,334	\$237,974	3
SF/SJ/GILROY DIVISIONS						
Engineer	402	\$1,552,311	\$243,252	\$688,953	\$2,484,516	30
Engineer - XBD	403	\$422,452	\$84,656	\$191,649	\$698,757	9
Conductor	404	\$1,356,052	\$77,422	\$571,443	\$2,004,917	28
Conductor - XBD	405	\$318,104	\$20,239	\$134,517	\$472,860	8
Assistant Conductor	406	\$1,451,727	\$117,761	\$619,612	\$2,189,100	43
Assistant Conductor - XBD	407	\$312,944	\$16,968	\$131,673	\$461,585	10
Bulletin & Assignment Clerk	408	\$31,024	\$1,396	\$12,989	\$45,409	1
FELA	409				\$550,723	
ADA TRAINING	410				\$122,688	
500 - TRAIN & YARD MOVEMENT CONTROL						
WAGES	501	\$615,204	\$1,396	\$285,507	\$902,107	14
FELA	502				\$2,931	
600 - REVENUE COLLECTION						
ADMINISTRATION - WAGES	601	\$73,127	\$0	\$33,872	\$106,999	2
STATION OPERATIONS - WAGES	602	\$587,889	\$28,389	\$289,810	\$906,088	18
FELA	603				\$55,712	
700 - REVENUE ACCOUNTING						
WAGES	701	\$128,142	\$8,376	\$66,480	\$202,998	4
FELA	702				\$9,171	
800 - BUDGETS						
WAGES	801	\$87,600	\$0	\$41,232	\$128,832	2
900 - MATERIAL CONTROL						
WAGES	901	\$134,569	\$3,723	\$65,763	\$204,055	4
FELA	902				\$5,944	
1000 - POLICE						
WAGES	1001	\$475,483	\$19,529	\$234,086	\$729,098	12
FELA	1002				\$41,997	

CALTRAIN DOWNTOWN STATION RELOCATION PROJECT
TABLE A-3. PCS DIESEL MODE O&M COST MODEL - NON-LABOR COST LIST

NON-LABOR COST ITEM	LOOKUP CODE	FY 1995 COST	
GENERAL & ADMINISTRATIVE			
OTHER			
Reallocation Expenses	1 101	\$180,000	
COLA Salary Adjustments	1.102	\$65,850	
Miscellaneous	1.103	\$458,505	\$704,355
MAINTENANCE OF RAIL LINE			
MATERIALS			
C&S Materials	2 101	\$298,000	
Track Materials	2 102	\$424,000	
B&B Materials	2.103	\$19,000	
Materials Handling	2 104	\$10,290	
FY 1994 Accrual	2 105	(\$125,000)	\$626,290
PURCHASED SERVICES			
Miscellaneous	2 201	\$174,400	
OTHER			
Equipment Rental	2.301	\$330,080	
Vehicle Leases - Admin.	2.302	\$29,613	
Vehicle Leases - Track	2.303	\$99,777	
Vehicle Leases - C&S	2.304	\$85,289	
Vehicle Supplies & Repairs	2.305	\$84,900	
Travel	2.306	\$5,500	
Safety Equipment	2.307	\$4,400	
Telephone	2.308	\$29,350	
Radio & Communications	2.309	\$41,900	
Other Related Costs	2.310	\$19,500	
Equipment Maint. & Repair	2.311	\$19,800	
Small Tools & Supplies	2.312	\$16,200	
Medical Expenses & Supplies	2.313	\$3,800	\$770,109
MAINTENANCE OF EQUIPMENT			
MATERIALS			
Maintenance Mat'l - Locomotive	3 101	\$573,136	
Loco. Engine & Generator Repair	3.102	\$166,500	
Car Maintenance Materials	3 103	\$764,662	
Materials Handling	3.104	\$30,086	
FY 94 Accrual	3.105	(\$145,000)	\$1,389,384
PURCHASED SERVICES			
Stand-By Power Maintenance	3 201	\$42,500	
Hazardous Waste/Trash Service	3.202	\$80,000	
Building Maint./Repair Services	3.203	\$8,500	
Outside Fabrication	3.204	\$88,500	
Sanding Services	3.205	\$39,000	
PA Repair Services	3.206	\$30,000	\$288,500
OTHER			
Equipment Rental	3.301	\$75,818	
Miscellaneous	3.302	\$101,728	\$177,546
TRAIN & YARD OPERATIONS			
OTHER	4.101	\$85,825	
TRAIN & YARD MOVEMENT CONTROL			
OTHER	5 101	\$51,490	
REVENUE COLLECTION			
PURCHASED SERVICES			
Amtrak - San Jose	6 101	\$185,500	
Armored Car Services	6 102	\$82,416	
OTHER	6.201	\$82,500	\$350,416
REVENUE ACCOUNTING			
OTHER	7.101	\$14,650	
BUDGETS			
OTHER	8.101	\$14,800	
MATERIAL CONTROL			
OTHER	9 101	\$62,702	
POLICE			
OTHER	10.101	\$110,755	
JPB COSTS			
INSURANCE	13 101	\$3,850,000	
FUEL	13.102	\$2,217,451	
SHUTTLES	13 103	\$3,490,400	
TIMETABLES & TICKETS	13 104	\$360,000	
UTILITIES	13 105	\$447,200	
INCENTIVE PAYMENTS	13.106	\$1,280,456	
OTHER CONTRACT AMTRAK	13 107	\$2,029,087	
RECOLLECTIBLE RECOVERIES	13 108	(\$1,666,486)	
GILROY TRACKAGE	13 109	\$447,000	
G&A/SUPPORT			
G&A and Professional Services	13 110	\$4,280,600	
Other Expenses and Services			
Service Equipment Cleaning	13.111	\$112,320	
Park and Ride Lot Maintenance	13.112	\$285,850	
Other Expenses	13 113	\$820,971	\$17,954,849

CALTRAIN DOWNTOWN STATION RELOCATION PROJECT
TABLE A-4. PCS DIESEL MODE O&M COST MODEL - LINE ITEM LISTING

COST ITEM	COST TYPE	LOOKUP CODE	FY 1995 \$COST	DRIVING VARIABLE	# OF EMPL'S	LINE ITEM COST	DEPT. COST
100 - GENERAL AND ADMINISTRATIVE							
LABOR	LABOR	101	\$500,385	TRIPS	7	\$500,385	
FELA	LABOR	102	\$8,666	#100 Wages		\$8,666	
OTHER							
Reallocation Expenses	OTHER	1.101	\$180,000	Total Op. Cost		\$180,000	
COLA Salary Adjustments	OTHER	1.102	\$65,850	# Total Empl.		\$65,850	
Miscellaneous	OTHER	1.103	\$458,505	# Total Empl.		\$458,505	\$1,213,406
200 - MAINTENANCE OF WAY							
LABOR - ADMINISTRATION	LABOR	201	\$381,896	#200 Empl.	5	\$381,896	
LABOR - TRACK							
Foreman - Track Inspection	LABOR	202	\$53,884	#200 Div Empl.	1	\$53,884	
Foreman - Track	LABOR	203	\$161,653	RTMILE1	3	\$161,653	
Trackman	LABOR	204	\$43,851	RTMILE1	1	\$43,851	
Operator/Tamper	LABOR	205	\$51,219	RTMILE1	1	\$51,219	
Operator/Regulator	LABOR	206	\$51,219	RTMILE1	1	\$51,219	
Operator/Compactor	LABOR	207	\$51,219	RTMILE1	1	\$51,219	
Operator/Backhoe	LABOR	208	\$102,437	RTMILE1	2	\$102,437	
Welder	LABOR	209	\$49,955	RTMILE1	1	\$49,955	
Welder's Helper	LABOR	210	\$46,832	RTMILE1	1	\$46,832	
Truck Driver	LABOR	211	\$97,595	RTMILE1	2	\$97,595	
Equipment Repairman	LABOR	212	\$51,640	RTMILE1	1	\$51,640	
Night Gang Pay Differential	LABOR	213	\$13,604	#200 Track Empl.		\$13,604	
LABOR - COMMUNICATIONS AND SIGNALS							
Inspector	LABOR	214	\$62,444	RTMILE1	1	\$62,444	
Maintainer - C&S	LABOR	215	\$607,391	RTMILE1	11	\$607,391	
Maintainer - Tests	LABOR	216	\$110,436	RTMILE1	2	\$110,436	
Radio Technician Lead	LABOR	217	\$62,855	RTMILE1	1	\$62,855	
Electronic Technician	LABOR	218	\$62,584	RTMILE1	1	\$62,584	
FELA	LABOR	219	\$104,304	# 200 Wages		\$104,304	
RECOLLECTIBLE WORK FORCE	LABOR	220	\$40,000	# 200 Wages		\$40,000	
MATERIALS							
C&S Materials	MATL	2.101	\$298,000	RTMILE1		\$298,000	
Track Materials	MATL	2.102	\$424,000	RTMILE1		\$424,000	
B&B Materials	MATL	2.103	\$19,000	RTMILE1		\$19,000	
Materials Handling	MATL	2.104	\$10,290	#200 Matl Cost		\$10,290	
FY 1994 Accrual	MATL	2.105	(\$125,000)	#200 Matl Cost		(\$125,000)	
PURCHASED SERVICES							
Miscellaneous	SERV	2.201	\$174,400	RTMILE1		\$174,400	
OTHER							
Equipment Rental	OTHER	2.301	\$330,080	RTMILE1		\$330,080	
Vehicle Leases - Admin.	OTHER	2.302	\$29,613	RTMILE1		\$29,613	
Vehicle Leases - Track	OTHER	2.303	\$99,777	RTMILE1		\$99,777	
Vehicle Leases - C&S	OTHER	2.304	\$85,289	RTMILE1		\$85,289	
Vehicle Supplies & Repairs	OTHER	2.305	\$84,900	RTMILE1		\$84,900	
Travel	OTHER	2.306	\$5,500	#200 Empl.		\$5,500	
Safety Equipment	OTHER	2.307	\$4,400	#200 Empl.		\$4,400	
Telephone	OTHER	2.308	\$29,350	#200 Empl.		\$29,350	
Radio & Communications	OTHER	2.309	\$41,900	#200 Empl.		\$41,900	
Other Related Costs	OTHER	2.310	\$19,500	#200 Empl.		\$19,500	
Equipment Maint. & Repair	OTHER	2.311	\$19,800	#200 Empl.		\$19,800	
Small Tools & Supplies	OTHER	2.312	\$16,200	#200 Empl.		\$16,200	
Medical Expenses & Supplies	OTHER	2.313	\$3,800	#200 Empl.		\$3,800	\$3,777,818
300 - MAINTENANCE OF EQUIPMENT							
LABOR - ADMINISTRATION	LABOR	301	\$245,086	#300 Empl.	3	\$245,086	
LABOR - SF/SJ/GILROY DIVISIONS							
Foreman	LABOR	302	\$546,400	#300 Div. Empl.	9	\$546,400	
Electrician	LABOR	303	\$858,599	TRAINMI	17	\$858,599	
Machinist	LABOR	304	\$353,541	TRAINMI	7	\$353,541	
Carman	LABOR	305	\$1,151,295	CARMILE	23	\$1,151,295	
Coach Cleaner	LABOR	306	\$659,782	PKCAR	18	\$659,782	
Pipefitter	LABOR	307	\$101,011	CARMILE	2	\$101,011	
Laborer	LABOR	308	\$236,849	CARMILE	6	\$236,849	
Clerk	LABOR	309	\$47,105	#300 Div. Empl.	1	\$47,105	
FELA	LABOR	310	\$243,049	#300 Wages		\$243,049	
ADA TRAINING	LABOR	311	\$14,840	#300 Wages		\$14,840	
MATERIALS							
Maintenance Mat'l - Locomotive	MATL	3.101	\$573,136	TRAINMI,PKLOCO		\$573,136	
Loco. Engine & Generator Repair	MATL	3.102	\$166,500	TRAINMI,PKLOCO		\$166,500	
Car Maintenance Materials	MATL	3.103	\$764,662	CARMILE,PKCAR		\$764,662	
Materials Handling	MATL	3.104	\$30,086	#300 Matl Cost		\$30,086	
FY 94 Accrual	MATL	3.105	(\$145,000)	#300 Matl Cost		(\$145,000)	
PURCHASED SERVICES							
Stand-By Power Maintenance	SERV	3.201	\$42,500	YARD		\$42,500	
Hazardous Waste/Trash Service	SERV	3.202	\$80,000	PKCAR		\$80,000	
Building Maint./Repair Services	SERV	3.203	\$8,500	YARD		\$8,500	
Outside Fabrication	SERV	3.204	\$88,500	TOTLOCO		\$88,500	
Sanding Services	SERV	3.205	\$39,000	TRAINMI		\$39,000	
PA Repair Services	SERV	3.206	\$30,000	PKCAR		\$30,000	

CALTRAIN DOWNTOWN STATION RELOCATION PROJECT
TABLE A-4. PCS DIESEL MODE O&M COST MODEL - LINE ITEM LISTING

COST ITEM	COST TYPE	LOOKUP CODE	FY 1995 \$COST	DRIVING VARIABLE	# OF EMPL'S	LINE ITEM COST	DEPT. COST
OTHER							
Equipment Rental	OTHER	3.301	\$75,818	#300 Empl		\$75,818	
Miscellaneous	OTHER	3.302	\$101,728	#300 Empl		\$101,728	\$6,312,987
400 - TRAIN OPERATIONS							
LABOR - ADMINISTRATION	LABOR	401	\$237,974	#400 Empl	3	\$237,974	
LABOR - SF/SJ/GILROY DIVISIONS							
Engineer	LABOR	402	\$2,484,516	TRAINHR	30	\$2,484,516	
Engineer - XBD	LABOR	403	\$698,757	# Engineer	9	\$698,757	
Conductor	LABOR	404	\$2,004,917	TRAINHR	28	\$2,004,917	
Conductor - XBD	LABOR	405	\$472,860	# Conductor	8	\$472,860	
Assistant Conductor	LABOR	406	\$2,189,100	TRAINHR	43	\$2,189,100	
Assistant Conductor - XBD	LABOR	407	\$461,585	# Ass't. Conductor	10	\$461,585	
Bulletin & Assignment Clerk	LABOR	408	\$45,409	# Div. Empl	1	\$45,409	
FELA	LABOR	409	\$550,723	#400 Wages		\$550,723	
ADA TRAINING	LABOR	410	\$122,688	#400 Wages		\$122,688	
OTHER	OTHER	4.101	\$85,825	#400 Wages		\$85,825	\$9,354,354
500 - TRAIN & YARD MOVEMENT CONTROL							
LABOR	LABOR	501	\$902,107	TRIPS	14	\$902,107	
FELA	LABOR	502	\$2,931	#500 Wages		\$2,931	
OTHER	OTHER	5.101	\$51,490	#500 Empl		\$51,490	\$956,528
600 - REVENUE COLLECTION							
LABOR - ADMINISTRATION	LABOR	601	\$106,999	#600 Empl	2	\$106,999	
LABOR - STATION OPERATIONS	LABOR	602	\$906,088	STATION	18	\$906,088	
FELA	LABOR	603	\$55,712	#600 Wages		\$55,712	
PURCHASED SERVICES							
Amtrak - San Jose	SERV	6.101	\$185,500	TERMINAL		\$185,500	
Armored Car Services	SERV	6.102	\$82,416	STATION		\$82,416	
OTHER	OTHER	6.201	\$82,500	#600 Empl		\$82,500	\$1,419,215
700 - REVENUE ACCOUNTING							
LABOR	LABOR	701	\$202,998	PASS	4	\$202,998	
FELA	LABOR	702	\$9,171	#700 Wages		\$9,171	
OTHER	OTHER	7.101	\$14,650	#700 Empl		\$14,650	\$226,819
800 - BUDGETS							
LABOR	LABOR	801	\$128,832	Total Op. Cost	2	\$128,832	
OTHER	OTHER	8.101	\$14,800	#800 Empl		\$14,800	\$143,632
900 - MATERIAL CONTROL							
LABOR	LABOR	901	\$204,055	YARD	4	\$204,055	
FELA	LABOR	902	\$5,944	#900 Wages		\$5,944	
OTHER	OTHER	9.101	\$62,702	#900 Empl		\$62,702	\$272,701
1000 - POLICE							
WAGES	LABOR	1001	\$729,098	TRIPS	12	\$729,098	
FELA	LABOR	1002	\$41,997	#1000 Wages		\$41,997	
OTHER	OTHER	10.101	\$110,755	# 1000 Empl		\$110,755	\$881,850
1100 - AMTRAK GENERAL OVERHEA	OTHER	n/a	5.7%	of Subtotal 1		\$1,399,881	\$1,399,881
1200 - AMTRAK MANAGEMENT FEE	OTHER	n/a	5.7%	of Subtotal 2		\$1,479,674	\$1,479,674
TOTAL AMTRAK CONTRACT							\$27,438,865
1300 - JPB COSTS							
INSURANCE	OTHER	13.101	\$3,850,000	PASS,TRIPS		\$3,850,000	
FUEL	OTHER	13.102	\$2,217,451	CARMILE		\$2,217,451	
SHUTTLES	OTHER	13.103	\$3,490,400	PASS		\$3,490,400	
TIMETABLES & TICKETS	OTHER	13.104	\$360,000	PASS		\$360,000	
UTILITIES	OTHER	13.105	\$447,200	STATION,YARD		\$447,200	
INCENTIVE PAYMENTS	OTHER	13.106	\$1,280,456	PASS		\$1,280,456	
OTHER CONTRACT AMTRAK	OTHER	13.107	\$2,029,087	AMTRAK \$		\$2,029,087	
RECOLLECTIBLE RECOVERIES	OTHER	13.108	(\$1,666,486)	AMTRAK \$		(\$1,666,486)	
GILROY TRACKAGE	OTHER	13.109	\$447,000	RTMILE2		\$447,000	
G&A/SUPPORT							
G&A and Professional Services	OTHER	13.110	\$4,280,600	AMTRAK \$		\$4,280,600	
Other Expenses and Services							
Service Equipment Cleaning	OTHER	13.111	\$112,320	TOTCAR		\$112,320	
Park and Ride Lot Maintenance	OTHER	13.112	\$285,850	PNR		\$285,850	
Other Expenses	OTHER	13.113	\$820,971	AMTRAK \$		\$820,971	\$17,954,849
TOTAL					317	\$45,393,714	\$45,393,714

COST SUMMARY:
Cost per Train Hour = \$1,493
Cost per Train Mile = \$46.76
Cost per Car Mile = \$12.66
Cost per Passenger = \$7.83

CALTRAIN DOWNTOWN STATION RELOCATION PROJECT
TABLE A-5. PCS DIESEL MODE O&M COST MODEL - COST SUMMARY TABLES

COSTS BY DEPARTMENT AND COST TYPE

DEPARTMENT		LABOR	MATL	SERV	OTHER	TOTAL COST
General & Administrative	100	\$509,051	\$0	\$0	\$704,355	\$1,213,406
Maintenance of Way	200	\$2,207,019	\$626,290	\$174,400	\$770,109	\$3,777,818
Maintenance of Equipment	300	\$4,457,557	\$1,389,384	\$288,500	\$177,546	\$6,312,987
Train and Yard Operations	400	\$9,268,529	\$0	\$0	\$85,825	\$9,354,354
Train and Yard Movement Control	500	\$905,038	\$0	\$0	\$51,490	\$956,528
Revenue Collection	600	\$1,068,799	\$0	\$267,916	\$82,500	\$1,419,215
Revenue Accounting	700	\$212,169	\$0	\$0	\$14,650	\$226,819
Budgets	800	\$128,832	\$0	\$0	\$14,800	\$143,632
Materials Control	900	\$209,999	\$0	\$0	\$62,702	\$272,701
Police	1000	\$771,095	\$0	\$0	\$110,755	\$881,850
Amtrak General Overhead	1100	\$0	\$0	\$0	\$1,399,881	\$1,399,881
Amtrak Management Fee	1200	\$0	\$0	\$0	\$1,479,674	\$1,479,674
JPB Costs	1300	\$0	\$0	\$0	\$17,954,849	\$17,954,849
Total Cost =		\$19,738,088	\$2,015,674	\$730,816	\$22,909,136	\$45,393,714

EMPLOYEES BY DEPARTMENT

DEPARTMENT	CODE	EMPLOYEES
General & Administrative	100	7
Maintenance of Way	200	36
Maintenance of Equipment	300	86
Train and Yard Operations	400	132
Train and Yard Movement Control	500	14
Revenue Collection	600	20
Revenue Accounting	700	4
Budgets	800	2
Materials Control	900	4
Police	1000	12
Amtrak General Overhead	1100	0
Amtrak Management Fee	1200	0
JPB Costs	1300	0
TOTAL		317

APPENDIX B

SamTrans O&M Cost Model

SAN MATEO TRANSIT O&M COST MODEL
TABLE B-1: INPUT VARIABLES

INPUT VARIABLE	DRIVING VARIABLE	CALIBRATION	VALIDATION	
		FY 1994	FY 1992	FY 1993
Motor Bus Unlinked Passenger Trips	PASS	19,564,573	19,540,743	19,190,847
Motor Bus Rev. Vehicle-Miles	VMI	7,930,652	7,934,563	7,854,287
Motor Bus Rev. Vehicle-Hours	HOURS	693,326	615,245	617,542
Peak Period Motor Buses	PKBUS	251	248	249
Demand Response Rev. Vehicle-Hours	DRHRS	68,077	42,080	46,669
Inflation Factor	INFLATE	1.00	0.95	0.98
=====		=====	=====	=====

SAN MATEO TRANSIT O&M COST MODEL
TABLE B-2: LINE ITEM SUMMARY

MODE	EXPENSE OBJECT CLASS	MODE	CODE	FY 1994 EXPENSE	DRIVER	LINE ITEM COST
MOTOR BUS	VEHICLE OPERATIONS					
	LABOR					
	Operator's Salaries & Wages	MB	501.01	\$10,320,738	HOURS	\$10,320,738
	Other Salaries & Wages	MB	501.02	\$1,625,489	HOURS	\$1,625,489
	Fringe Benefits	MB	502.00	\$4,491,578	Labor \$	\$4,491,578
	NON LABOR	MB				
	Services	MB	503.00	\$141,825	HOURS	\$141,825
	Materials and Supplies	MB				
	Fuel & Lubricants	MB	504.01	\$1,383,378	VMI	\$1,383,378
	Tires and Tubes	MB	504.02	\$5,370	VMI	\$5,370
	Other Materials & Supplies	MB	504.99	\$93,767	VMI	\$93,767
	Purchased Transportation	MB	508.00	\$9,367,639	HOURS	\$9,367,639
	VEHICLE MAINTENANCE	MB				
	LABOR	MB				
	Other Salaries & Wages	MB	501.02	\$3,360,256	VMI	\$3,360,256
	Fringe Benefits	MB	502.00	\$1,399,351	Labor \$	\$1,399,351
	NON-LABOR	MB				
	Services	MB	503.00	\$575,330	VMI	\$575,330
	Materials and Supplies	MB	504.99	\$1,763,223	VMI	\$1,763,223
	Purchased Transportation	MB	508.00	\$63,810	VMI	\$63,810
	NON-VEHICLE MAINTENANCE	MB				
	LABOR	MB				
	Other Salaries & Wages	MB	501.02	\$119,916	PKBUS	\$119,916
	Fringe Benefits	MB	502.00	\$46,864	Labor \$	\$46,864
	NON LABOR	MB				
	Services	MB	503.00	\$1,079,810	PKBUS	\$1,079,810
	Materials and Supplies	MB	504.99	\$86,429	PKBUS	\$86,429
	Purchased Transportation	MB	508.00	\$14,418	PKBUS	\$14,418
	GENERAL ADMINISTRATION	MB				
	LABOR	MB				
	Other Salaries & Wages	MB	501.02	\$2,741,319	PKBUS	\$2,741,319
	Fringe Benefits	MB	502.00	\$892,704	Labor \$	\$892,704
	NON LABOR	MB				
	Services	MB	503.00	\$1,817,580	PKBUS	\$1,817,580
	Materials and Supplies	MB	504.99	\$470,208	PKBUS	\$470,208
	Utilities	MB	505.00	\$651,190	PKBUS	\$651,190
	Casualty & Liability	MB	506.00	\$2,682,774	PASS	\$2,682,774
	Taxes	MB	507.00	\$170,128	PKBUS	\$170,128
	Purchased Transportation	MB	508.00	\$2,069,280	PKBUS	\$2,069,280
	Miscellaneous Expenses	MB	509.00	\$423,792	PKBUS	\$423,792
	Expense Transfers	MB	510.00	(\$302,965)	PKBUS	(\$302,965)
DEMAND RESPONSE	PURCHASED TRANSPORTATION	DR	508.00	\$2,541,603	DRHRS	\$2,541,603

TOTAL **\$50,096,804**

NOTE: Costs are in FY 1994 dollars.

Prepared by Manuel Padron & Associates

08/29/95

SAN MATEO TRANSIT O&M COST MODEL
TABLE B-3: COST SUMMARY TABLES

TOTAL COST BY COST FUNCTION

	Motor Bus	Demand Resp.	Total
Vehicle Operations	\$27,429,784	\$2,541,603	\$29,971,387
Vehicle Maintenance	\$7,161,970		\$7,161,970
Non-Vehicle Maintenance	\$1,347,437		\$1,347,437
General Administration	\$11,616,010		\$11,616,010
TOTAL	\$47,555,201	\$2,541,603	\$50,096,804

TOTAL COST BY SECTION 15 OBJECT CODE

		Motor Bus	Demand Resp.	Total
Operator's Salaries & Wages	501.01	\$10,320,738	\$0	\$10,320,738
Other Salaries & Wages	501.02	\$7,846,980	\$0	\$7,846,980
Fringe Benefits	502.00	\$6,830,497	\$0	\$6,830,497
Services	503.00	\$3,614,545	\$0	\$3,614,545
Fuel & Lubricants	504.01	\$1,383,378	\$0	\$1,383,378
Tires & Tubes	504.02	\$5,370	\$0	\$5,370
Other Materials & Supplies	504.99	\$2,413,627	\$0	\$2,413,627
Utilities	505.00	\$651,190	\$0	\$651,190
Casualty & Liability	506.00	\$2,682,774	\$0	\$2,682,774
Taxes	507.00	\$170,128	\$0	\$170,128
Purchased Transp. Services	508.00	\$11,515,147	\$2,541,603	\$14,056,750
Miscellaneous Expenses	509.00	\$423,792	\$0	\$423,792
Expenses Transfer	510.00	(\$302,965)	\$0	(\$302,965)
Leases & Rentals	512.00	\$0	\$0	\$0
TOTAL		\$47,555,201	\$2,541,603	\$50,096,804

NOTE: Costs are in FY 1994 dollars.

SAN MATEO TRANSIT O&M COST MODEL
TABLE B-4: VALIDATION RESULTS

Calibration Year	Mode	Model Cost Estimates	Actual Expenditures	Difference (\$)	%
1992					
	Motor Bus	\$42,107,586	\$43,702,835	(\$1,595,249)	-3.7%
	Demand Response	\$1,486,189	\$1,726,341	(\$240,152)	-13.9%
	Total Costs	\$43,593,775	\$45,429,176	(\$1,835,401)	-4.0%
	Labor Costs	\$21,856,328	\$24,691,195	(\$2,834,867)	-11.5%
	Non-Labor Costs	\$21,737,447	\$20,737,981	\$999,466	4.8%
1993					
	Motor Bus	\$43,390,066	\$44,657,064	(\$1,266,998)	-2.8%
	Demand Response	\$1,698,793	\$2,154,643	(\$455,850)	-21.2%
	Total Costs	\$45,088,859	\$46,811,707	(\$1,722,848)	-3.7%
	Labor Costs	\$22,547,231	\$25,050,315	(\$2,503,084)	-10.0%
	Non-Labor Costs	\$22,541,628	\$21,761,392	\$780,236	3.6%

APPENDIX C
MUNI O&M Cost Model

**SAN FRANCISCO MUNICIPAL RAILWAY
TABLE C-1: INPUT VARIABLES**

INPUT VARIABLE	DRIVING VARIABLE	CALIBRATION	VALIDATION		
		FY 1994	FY 1991	FY 1992	FY 1993
Motor Bus Unlinked Passenger Trips	PASS	93,993,513	96,460,165	101,229,495	99,172,257
Motor Bus Rev. Vehicle-Miles	VMI	12,646,266	12,809,246	13,051,953	13,134,805
Motor Bus Rev. Vehicle-Hours	HOURS	1,369,182	1,374,729	1,397,348	1,418,266
Peak Period Motor Buses	PKBUS	379	374	380	386
Demand Resp. Rev. Vehicle-Hours	DRHRS	101,718	138,867	149,764	92,784
Light Rail Unlinked Passenger Trips	LRPASS	37,615,493	40,213,584	40,043,628	39,331,872
Light Rail Rev. Train-Miles	LRVMI	3,621,629	4,092,838	4,130,229	3,874,627
Light Rail Rev. Train-Hours	LRHRS	342,021	385,389	389,010	371,618
Light Rail Peak Period Motor Vehicles	LRPEAK	99	101	101	101
Trolley Bus Unlinked Passenger Trips	TBPASS	78,752,101	86,287,081	87,018,324	81,807,925
Trolley Bus Rev. Vehicle-Miles	TBVMI	7,144,937	7,355,546	7,336,926	6,969,748
Trolley Bus Rev. Vehicle-Hours	TBHRS	993,024	988,722	997,328	967,933
Trolley Bus Peak Period Vehicles	TBPKBUS	264	262	265	265
Cable Car Unlinked Passenger Trips	CCPASS	9,555,142	10,507,412	10,641,967	9,606,100
Cable Car Rev. Vehicle-Miles	CCVMI	532,534	566,341	578,917	526,040
Cable Car Rev. Vehicle-Hours	CCHRS	132,325	132,313	136,059	130,768
Cable Car Peak Period Vehicles	CCPEAK	26	26	26	26
Inflation Factor	INFLATE	1.00	0.92	0.95	0.98
=====					

Prepared by Manuel Padron & Associates

08/28/95

SAN FRANCISCO MUNICIPAL RAILWAY
TABLE C-2: LINE ITEM SUMMARY

MODE	EXPENSE OBJECT CLASS	MODE	CODE	FY 1994 EXPENSE	DRIVER	LINE ITEM COST
MOTOR BUS	VEHICLE OPERATIONS					
	LABOR					
	Wages & Fringe Benefits	MB	501.00	\$55,645,356	HOURS	\$55,645,356
	NON LABOR	MB				
	Services	MB	503.00	\$298,671	HOURS	\$298,671
	Materials and Supplies	MB				
	Fuel & Lubricants	MB	504.01	\$4,151,765	VMI	\$4,151,765
	Tires and Tubes	MB	504.02	\$1,875,425	VMI	\$1,875,425
	Other Materials & Supplies	MB	504.99	\$81,432	PKBUS	\$81,432
	Expense transfers	MB	510.00	(\$82,556)	PKBUS	(\$82,556)
	VEHICLE MAINTENANCE	MB				
	LABOR	MB				
	Wages & Fringe Benefits	MB	501.00	\$18,549,409	VMI	\$18,549,409
	NON-LABOR	MB				
	Services	MB	503.00	\$2,609,837	VMI	\$2,609,837
	Materials and Supplies	MB	504.99	\$5,385,404	VMI	\$5,385,404
	Utilities	MB	505.00	\$262,293	PKBUS	\$262,293
	Miscellaneous Expenses	MB	509.00	\$146,534	VMI	\$146,534
	Expense Transfers	MB	510.00	\$142,030	PKBUS	\$142,030
	NON-VEHICLE MAINTENANCE	MB				
	LABOR	MB				
	Wages & Fringe Benefits	MB	501.00	\$3,727,233	PKBUS	\$3,727,233
	NON LABOR	MB				
	Services	MB	503.00	\$1,167,416	PKBUS	\$1,167,416
	Materials and Supplies	MB				
	Fuel & Lubricants	MB	504.01	\$7,262	PKBUS	\$7,262
	Other Materials & Supplies	MB	504.99	\$578,147	PKBUS	\$578,147
	Miscellaneous Expenses	MB	509.00	\$96,466	PKBUS	\$96,466
	Expense Transfers	MB	510.00	\$290,759	PKBUS	\$290,759
	GENERAL ADMINISTRATION	MB				
	LABOR	MB				
	Wages & Fringe Benefits	MB	501.00	\$6,959,738	PKBUS	\$6,959,738
	NON LABOR	MB				
	Services	MB	503.00	\$7,214,525	PKBUS	\$7,214,525
	Materials and Supplies	MB	504.99	\$84,394	PKBUS	\$84,394
	Utilities	MB	505.00	\$268,915	PKBUS	\$268,915
	Casualty & Liability	MB	506.00	\$5,966,209	VMI	\$5,966,209
	Miscellaneous Expenses	MB	509.00	\$388,295	PKBUS	\$388,295
	Expense Transfers	MB	510.00	\$424,363	PKBUS	\$424,363
DEMAND RESPONSE	GENERAL ADMINISTRATION					
	Purchased Transportation	DR	508.00	\$10,032,889	DRHRS	\$10,032,889

SAN FRANCISCO MUNICIPAL RAILWAY
TABLE C-2: LINE ITEM SUMMARY

MODE	EXPENSE OBJECT CLASS	MODE	CODE	FY 1994 EXPENSE	DRIVER	LINE ITEM COST
LIGHT RAIL	VEHICLE OPERATIONS					
	LABOR					
	Wages & Fringe Benefits	LR	501.00	\$23,435,809	LRHRS	\$23,435,809
	NON LABOR	LR				
	Services	LR	503.00	\$290,248	LRHRS	\$290,248
	Materials and Supplies	LR	504.99	\$46,910	LRVMI	\$46,910
	Utilities	LR	505.00	\$1,177,985	LRVMI	\$1,177,985
	Expense Transfers	LR	510.00	(\$44,023)	LRPEAK	(\$44,023)
	VEHICLE MAINTENANCE	LR				
	LABOR	LR				
	Wages & Fringe Benefits	LR	501.00	\$13,086,988	LRVMI	\$13,086,988
	NON-LABOR	LR				
	Services	LR	503.00	\$589,116	LRVMI	\$589,116
	Materials and Supplies	LR	504.99	\$2,832,996	LRVMI	\$2,832,996
	Utilities	LR	505.00	\$219,594	LRPEAK	\$219,594
	Taxes	LR	507.00	\$46	LRVMI	\$46
	Miscellaneous Expenses	LR	509.00	\$792,475	LRVMI	\$792,475
	Expense Transfers	LR	510.00	\$75,737	LRPEAK	\$75,737
	NON-VEHICLE MAINTENANCE	LR				
	LABOR	LR				
	Wages & Fringe Benefits	LR	501.00	\$7,201,812	LRPEAK	\$7,201,812
	NON LABOR	LR				
	Services	LR	503.00	\$724,562	LRVMI	\$724,562
	Materials and Supplies	LR				
	Fuel & Lubricants	LR	504.01	\$3,536	LRVMI	\$3,536
	Other Materials & Supplies	LR	504.99	\$343,241	LRVMI	\$343,241
	Miscellaneous Expenses	LR	509.00	\$523,116	LRVMI	\$523,116
	Expense Transfers	LR	510.00	\$155,046	LRVMI	\$155,046
	GENERAL ADMINISTRATION	LR				
	LABOR	LR				
	Wages & Fringe Benefits	LR	501.00	\$3,711,252	LRPEAK	\$3,711,252
	NON LABOR	LR				
	Services	LR	503.00	\$3,847,117	LRPEAK	\$3,847,117
	Materials and Supplies	LR	504.99	\$45,003	LRPEAK	\$45,003
	Utilities	LR	505.00	\$143,398	LRPEAK	\$143,398
	Casualty & Liability	LR	506.00	\$3,181,457	LRVMI	\$3,181,457
	Miscellaneous Expenses	LR	509.00	\$221,028	LRPEAK	\$221,028
	Expense Transfers	LR	510.00	\$226,290	LRPEAK	\$226,290

SAN FRANCISCO MUNICIPAL RAILWAY
TABLE C-2: LINE ITEM SUMMARY

MODE	EXPENSE OBJECT CLASS	MODE	CODE	FY 1994 EXPENSE	DRIVER	LINE ITEM COST
TROLLEY BUS	VEHICLE OPERATIONS					
	LABOR					
	Wages & Fringe Benefits	TB	501.00	\$41,578,253	TBHRS	\$41,578,253
	NON LABOR	TB				
	Services	TB	503.00	\$110,935	TBHRS	\$110,935
	Materials and Supplies	TB	504.99	\$44,917	TBPKBUS	\$44,917
	Utilities	TB	505.00	\$1,105,864	TBVM	\$1,105,864
	Expense Transfers	TB	510.00	(\$46,272)	TBPKBUS	(\$46,272)
	VEHICLE MAINTENANCE	TB				
	LABOR	TB				
	Wages & Fringe Benefits	TB	501.00	\$10,867,260	TBVM	\$10,867,260
	NON-LABOR	TB				
	Services	TB	503.00	\$470,746	TBVM	\$470,746
	Materials and Supplies	TB	504.99	\$2,172,599	TBVM	\$2,172,599
	Utilities	TB	505.00	\$128,096	TBPKBUS	\$128,096
	Casualty & Liability	TB	506.00	\$53,042	TBVM	\$53,042
	Miscellaneous Expenses	TB	509.00	\$34,208	TBVM	\$34,208
	Expense Transfers	TB	510.00	\$79,608	TBPKBUS	\$79,608
	NON-VEHICLE MAINTENANCE	TB				
	LABOR	TB				
	Wages & Fringe Benefits	TB	501.00	\$3,563,082	TBPKBUS	\$3,563,082
	NON LABOR	TB				
	Services	TB	503.00	\$688,722	TBPKBUS	\$688,722
	Materials and Supplies	TB				
	Fuel & Lubricants	TB	504.01	\$3,717	TBPKBUS	\$3,717
	Other Materials & Supplies	TB	504.99	\$300,865	TBPKBUS	\$300,865
	Miscellaneous Expenses	TB	509.00	\$46,622	TBPKBUS	\$46,622
	Expense Transfers	TB	510.00	\$162,971	TBPKBUS	\$162,971
	GENERAL ADMINISTRATION	TB				
	LABOR	TB				
	Wages & Fringe Benefits	TB	501.00	\$3,900,932	TBPKBUS	\$3,900,932
	NON LABOR	TB				
	Services	TB	503.00	\$4,043,741	TBPKBUS	\$4,043,741
	Materials and Supplies	TB	504.99	\$47,303	TBPKBUS	\$47,303
	Utilities	TB	505.00	\$150,727	TBPKBUS	\$150,727
	Casualty & Liability	TB	506.00	\$3,344,060	TBVM	\$3,344,060
	Miscellaneous Expenses	TB	509.00	\$232,324	TBPKBUS	\$232,324
	Expense Transfers	TB	510.00	\$237,856	TBPKBUS	\$237,856

SAN FRANCISCO MUNICIPAL RAILWAY
TABLE C-2: LINE ITEM SUMMARY

MODE	EXPENSE OBJECT CLASS	MODE	CODE	FY 1994 EXPENSE	DRIVER	LINE ITEM COST
CABLE CAR	VEHICLE OPERATIONS					
	LABOR					
	Wages & Fringe Benefits	CC	501.00	\$9,776,044	CCHRS	\$9,776,044
	NON LABOR	CC				
	Services	CC	503.00	\$32,370	CCHRS	\$32,370
	Materials and Supplies	CC	504.99	\$3,296	CCPEAK	\$3,296
	Utilities	CC	505.00	\$120,203	CCVMI	\$120,203
	Expense Transfers	CC	510.00	(\$3,396)	CCPEAK	(\$3,396)
	VEHICLE MAINTENANCE					
	LABOR	CC				
	Wages & Fringe Benefits	CC	501.00	\$2,235,961	CCVMI	\$2,235,961
	NON-LABOR	CC				
	Services	CC	503.00	\$70,601	CCVMI	\$70,601
	Materials and Supplies	CC	504.99	\$299,321	CCVMI	\$299,321
	Miscellaneous Expenses	CC	509.00	\$2,350	CCVMI	\$2,350
	Expense Transfers	CC	510.00	\$5,842	CCPEAK	\$5,842
	NON-VEHICLE MAINTENANCE					
	LABOR	CC				
	Wages & Fringe Benefits	CC	501.00	\$2,860,322	CCPEAK	\$2,860,322
	NON LABOR	CC				
	Services	CC	503.00	\$161,337	CCPEAK	\$161,337
	Materials and Supplies	CC				
	Fuel & Lubricants	CC	504.01	\$33,285	CCPEAK	\$33,285
	Other Materials & Supplies	CC	504.99	\$357,984	CCPEAK	\$357,984
	Miscellaneous Expenses	CC	509.00	\$47,647	CCPEAK	\$47,647
	Expense Transfers	CC	510.00	\$11,960	CCPEAK	\$11,960
	GENERAL ADMINISTRATION					
	LABOR	CC				
	Wages & Fringe Benefits	CC	501.00	\$286,276	CCPEAK	\$286,276
	NON LABOR	CC				
	Services	CC	503.00	\$296,756	CCPEAK	\$296,756
	Materials and Supplies	CC	504.99	\$3,471	CCPEAK	\$3,471
	Utilities	CC	505.00	\$11,061	CCPEAK	\$11,061
	Casualty & Liability	CC	506.00	\$245,408	CCVMI	\$245,408
	Miscellaneous Expenses	CC	509.00	\$17,049	CCPEAK	\$17,049
	Expense Transfers	CC	510.00	\$17,455	CCPEAK	\$17,455
TOTAL						\$279,317,731

NOTE: Costs are in FY 1994 dollars.

Prepared by Manuel Padron & Associates

08/28/95

**SAN FRANCISCO MUNICIPAL RAILWAY
TABLE C-3: COST SUMMARY TABLES**

TOTAL COST BY COST FUNCTION

	Motor Bus	Demand Resp.	Light Rail	Trolley Bus	Cable Car	Total
Vehicle Operations	\$61,970,093	\$10,032,889	\$24,906,929	\$42,793,697	\$9,928,517	\$149,632,125
Vehicle Maintenance	\$27,095,507	\$0	\$17,596,952	\$13,805,559	\$2,614,075	\$61,112,093
Non-Vehicle Maintenance	\$5,867,283	\$0	\$8,951,313	\$4,765,979	\$3,472,535	\$23,057,110
General Administration	\$21,306,439	\$0	\$11,375,545	\$11,956,943	\$877,476	\$45,516,403
TOTAL	\$116,239,322	\$10,032,889	\$62,830,739	\$73,322,178	\$16,892,603	\$279,317,731

TOTAL COST BY SECTION 15 OBJECT CODE

		Motor Bus	Demand Resp.	Light Rail	Trolley Bus	Cable Car	Total
Wages & Fringe Benefits	501.00	\$84,881,736	\$0	\$47,435,861	\$59,909,527	\$15,158,603	\$207,385,727
Services	503.00	\$11,290,449	\$0	\$5,451,043	\$5,314,144	\$561,064	\$22,616,700
Fuel & Lubricants	504.01	\$4,159,027	\$0	\$3,536	\$3,717	\$33,285	\$4,199,565
Tires & Tubes	504.02	\$1,875,425	\$0	\$0	\$0	\$0	\$1,875,425
Other Materials & Supplies	504.99	\$6,129,377	\$0	\$3,268,150	\$2,565,684	\$664,072	\$12,627,283
Utilities	505.00	\$531,208	\$0	\$1,540,977	\$1,384,687	\$131,264	\$3,588,136
Casualty & Liability	506.00	\$5,966,209	\$0	\$3,181,457	\$3,397,102	\$245,408	\$12,790,176
Taxes	507.00	\$0	\$0	\$46	\$0	\$0	\$46
Purchased Transp. Services	508.00	\$0	\$10,032,889	\$0	\$0	\$0	\$10,032,889
Miscellaneous Expenses	509.00	\$631,295	\$0	\$1,536,619	\$313,154	\$67,046	\$2,548,114
Expenses Transfer	510.00	\$774,596	\$0	\$413,050	\$434,163	\$31,861	\$1,653,670
TOTAL		\$116,239,322	\$10,032,889	\$62,830,739	\$73,322,178	\$16,892,603	\$279,317,731

NOTE: Costs are in FY 1994 dollars.

Prepared by Manuel Padron & Associates

08/28/95

SAN FRANCISCO MUNICIPAL RAILWAY O&M COST MODEL
TABLE C-4: VALIDATION RESULTS

Calibration Year	Mode	Model Cost Estimates	Actual Expenditures	Difference (\$)	%
FY 1991					
	Motor Bus	\$107,578,424	\$103,341,667	\$4,236,757	4.1%
	Demand Response	\$12,628,686	\$3,725,381	\$8,903,305	239.0%
	Light Rail	\$63,976,377	\$58,128,463	\$5,847,914	10.1%
	Trolley Bus	\$67,832,131	\$61,187,297	\$6,644,834	10.9%
	Cable Car	\$15,748,224	\$16,793,830	(\$1,045,606)	-6.2%
	Total Costs	\$267,763,842	\$243,176,638	\$24,587,204	10.1%
	Labor Costs	\$196,395,371	\$191,112,920	\$5,282,451	2.8%
	Non-Labor Costs	\$71,368,471	\$52,063,718	\$19,304,753	37.1%
FY 1992					
	Motor Bus	\$112,753,766	\$111,626,216	\$1,127,550	1.0%
	Demand Response	\$14,033,281	\$5,375,784	\$8,657,497	161.0%
	Light Rail	\$66,372,034	\$61,712,570	\$4,659,464	7.6%
	Trolley Bus	\$70,337,319	\$63,252,872	\$7,084,447	11.2%
	Cable Car	\$16,556,979	\$18,408,754	(\$1,851,775)	-10.1%
	Total Costs	\$280,053,379	\$260,376,196	\$19,677,183	7.6%
	Labor Costs	\$204,789,094	\$203,848,033	\$941,061	0.5%
	Non-Labor Costs	\$75,264,285	\$56,528,163	\$18,736,122	33.1%
FY 1993					
	Motor Bus	\$117,375,253	\$117,140,485	\$234,768	0.2%
	Demand Response	\$8,941,201	\$8,561,964	\$379,237	4.4%
	Light Rail	\$65,393,582	\$63,043,321	\$2,350,261	3.7%
	Trolley Bus	\$70,224,558	\$71,150,993	(\$926,435)	-1.3%
	Cable Car	\$16,355,886	\$17,416,834	(\$1,060,948)	-6.1%
	Total Costs	\$278,290,480	\$277,313,597	\$976,883	0.4%
	Labor Costs	\$207,241,801	\$206,828,255	\$413,546	0.2%
	Non-Labor Costs	\$71,048,679	\$70,485,342	\$563,337	0.8%

